

ANTARES atmospheric neutrino flux measurement

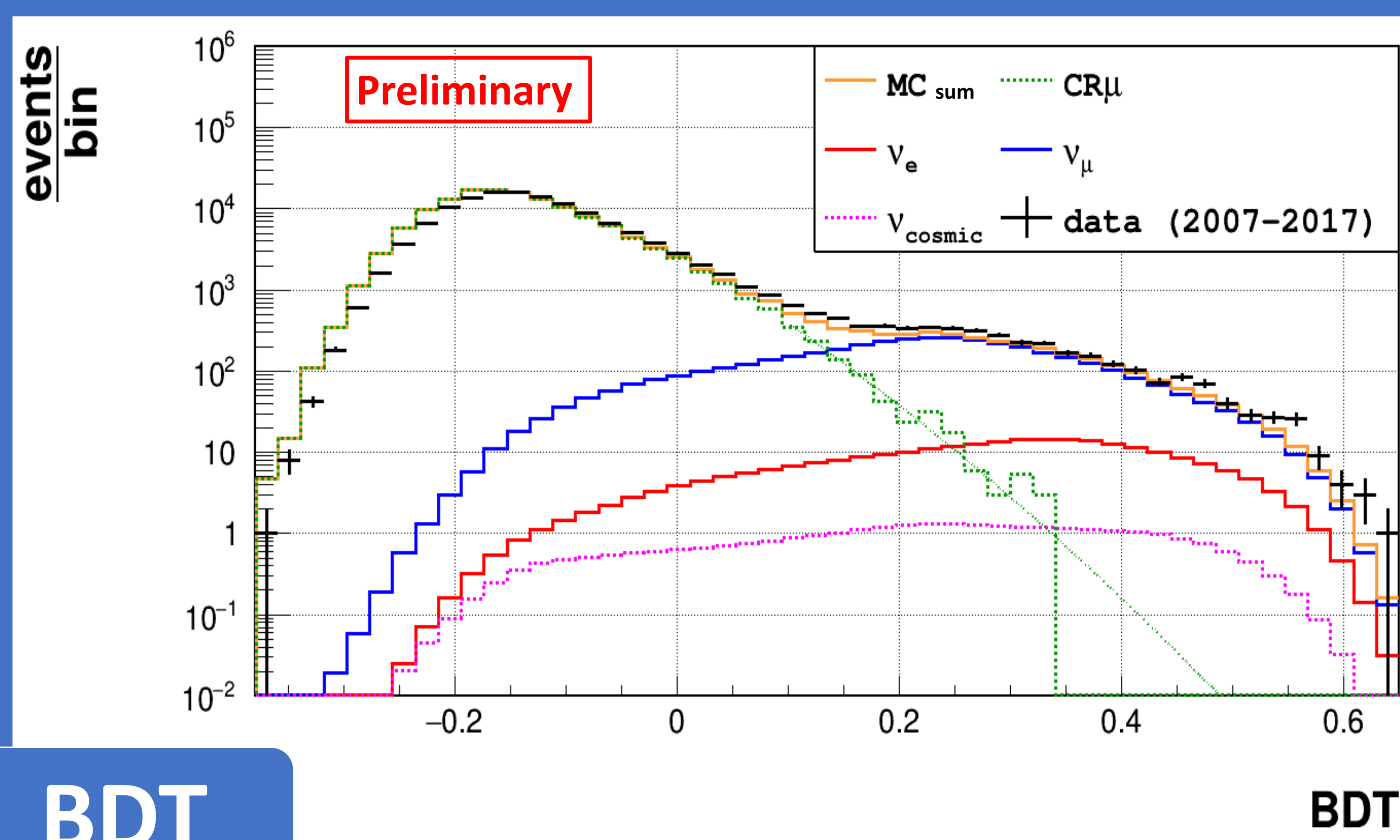
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on behalf of the ANTARES collaboration

References:

- [1] M.G. Aartsen et al. (IceCube Collaboration), Phys. Rev. D 91 (2015) 122004
- [2] M.G. Aartsen et al. (IceCube Collaboration), Phys. Rev. Lett. 110 (2013) 151105
- [3] S. Adrian-Martinez et al. (ANTARES Collaboration), Eur. Phys. J. C 73 (2013) 2606
- [4] L.A. Fusco and F. Versari (ANTARES Collaboration) PoS(ICRC2019)891

We report here the results of the first measurement with the ANTARES neutrino telescope of the atmospheric ν_e flux, combined with that of the atmospheric ν_μ , in the energy range between 50 GeV and 50 TeV, using data collected in more than 10 years of livetime. A new event selection strategy based on a Boosted Decision Tree (BDT), that combines observables computed by several reconstruction algorithms, has been used. The strategy significantly suppresses the atmospheric muon background, while preserves a statistically significant neutrino sample. Finally, an unfolding procedure has been used to simultaneously derive the flux of atmospheric electron neutrinos, and that of atmospheric muon neutrinos. Both the measured fluxes are compatible with the previous measurements [1,2,3].



BDT

Event selection

- **Preselection:** General and simple criteria to have a reliable sample of events (run selection, geometrical condition, well reconstructed events)
- **Final selection:** Boosted Decision Tree (BDT) to reject all the atmospheric muons

Data sample:

ANTARES data
2007-2017

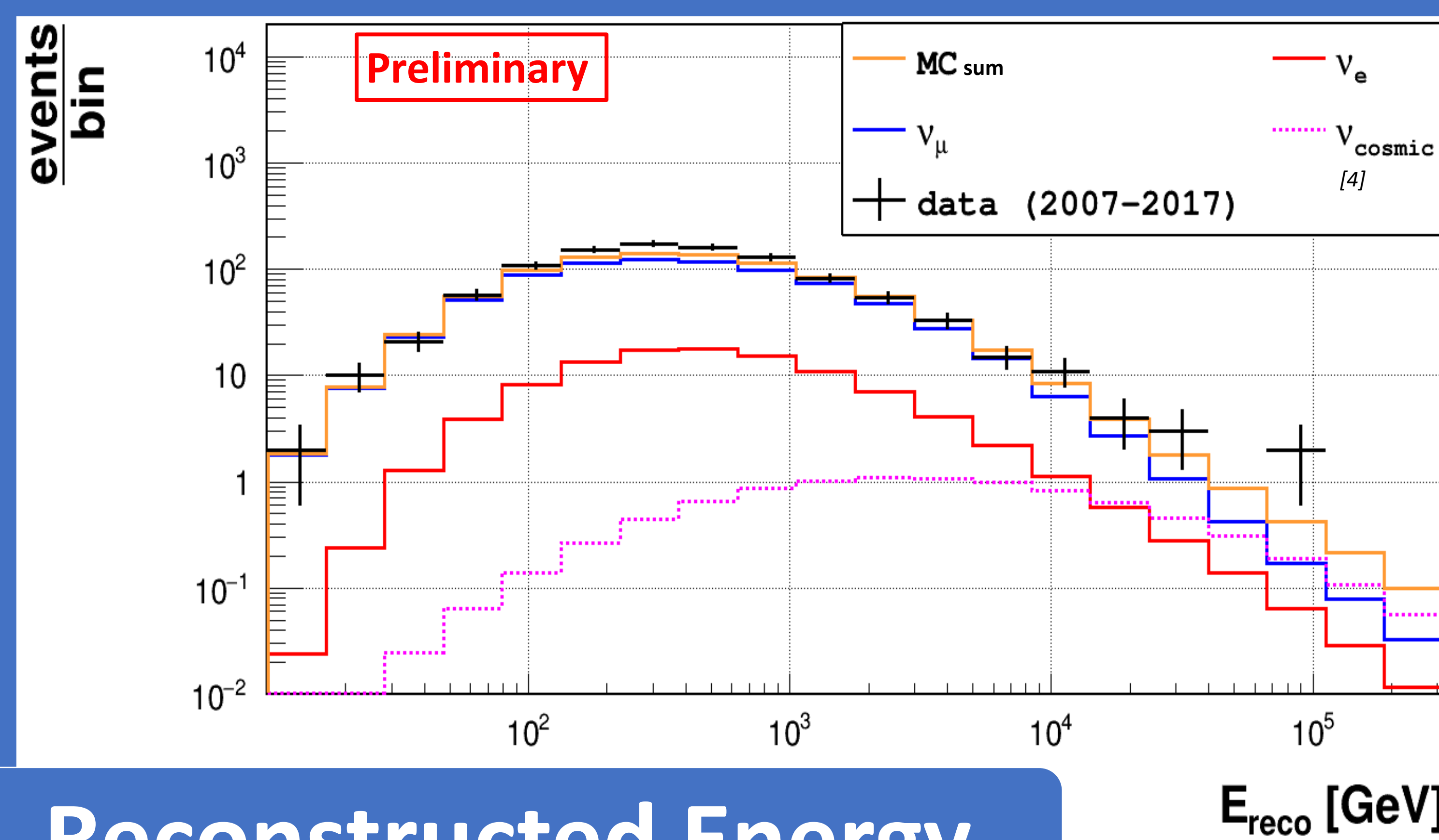
Signal:

atmospheric
[(a) ν_e + (a) ν_μ]
(CC + NC)

Background:

atmospheric
muons

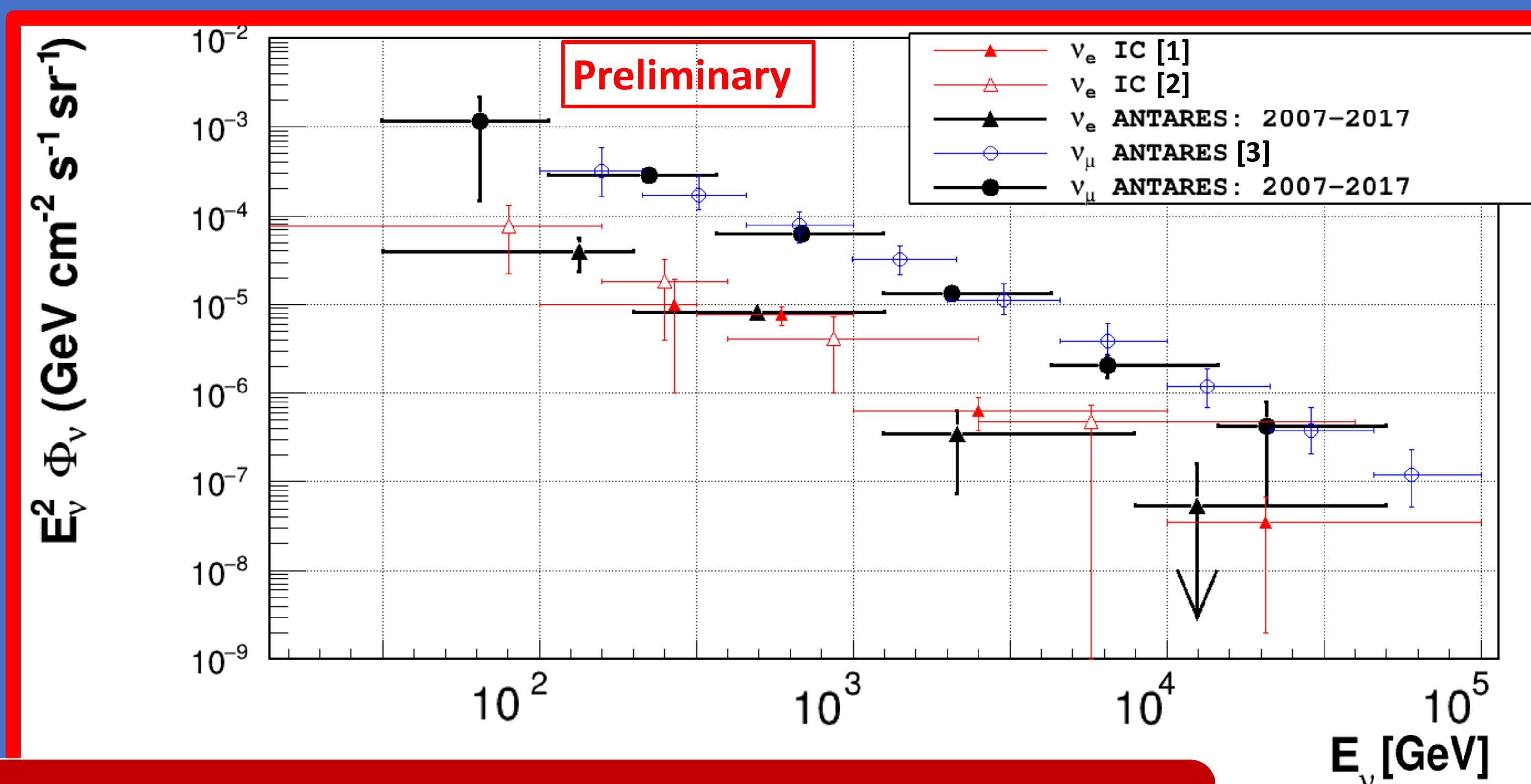
	Preselection	Final selection
Data	133676	1016
MC sum	141200	914
CR μ	136700	$\lesssim 3$
Atmospheric ν_e CC	242	95.6
Atmospheric ν_e NC	21.6	8.6
Atmospheric ν_μ CC	3780	620
Atmospheric ν_μ NC	401	180
Cosmic ν [4]	30.4	9.2



Reconstructed Energy

Unfolding

- Algorithm: TUnfold (least square fit with Tikhonov regularisation and background subtraction)
- Unfolded ν_e and ν_μ
- Energy range:
[50 GeV – 50 TeV]
- No systematics included



Atmospheric neutrino flux